

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
24 July 2003 (24.07.2003)

PCT

(10) International Publication Number  
WO 03/059606 A1

(51) International Patent Classification<sup>7</sup>:  
B29B 17/00

B30B 9/32,

(74) Agent: DANUBIA PATENT AND TRADEMARK AT-  
TORNEYS; Bajcsy Zsilinszky út 16, H-1051 Budapest  
(HU).

(21) International Application Number: PCT/HU02/00159

(22) International Filing Date:  
20 December 2002 (20.12.2002)

(25) Filing Language: Hungarian

(26) Publication Language: English

(30) Priority Data:  
P 0200176 16 January 2002 (16.01.2002) HU

(71) Applicant and

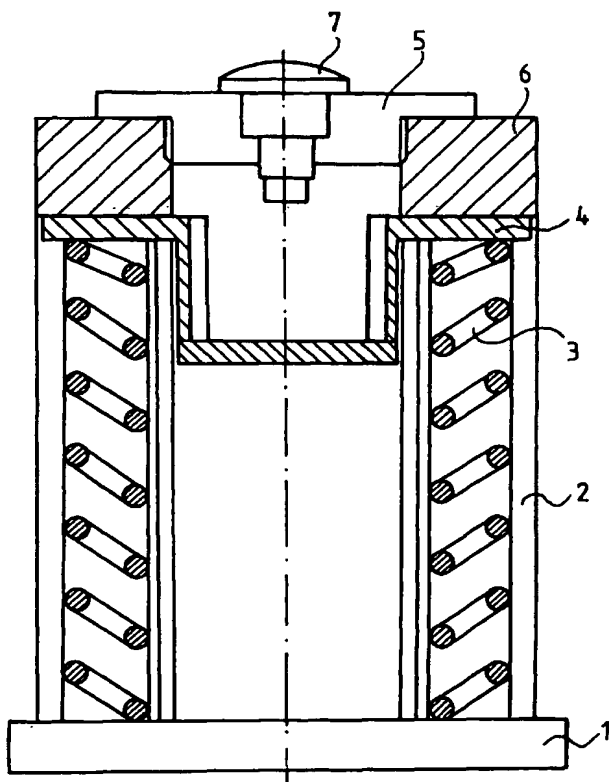
(72) Inventor: SIMON, Lajos [HU/HU]; Táncsics Mihály út  
33, H-2457 Adony (HU).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,  
SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC,  
VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK,  
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: DEVICE FOR REDUCING THE VOLUME OF BOTTLES MADE OF PLASTIC MATERIAL



(57) **Abstract:** The apparatus according to the invention comprises a housing or frame (2) for receiving the bottle, an element for fixing the bottle, a heating element (6) surrounding part of the bottle and compressing means for compacting the softened bottle, wherein the housing or frame (2) is constructed to receive the bottle with its mouth part upwards, the heating element (6) or the part of the heating element surrounding the bottle is at most 60 mm high, and is arranged around the neck part of the bottle in its starting position and the fixing element is a sealable plug (7) in the compressing means, to be fitted into the mouth of the bottle and having an air channel, the cross section of which is preferably adjustable, preferably with flow control means. The flow control means may be a valve.

Rec'd PCT 16 JUL 2004

WO 03/059606 A1



**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

5

## DEVICE FOR REDUCING THE VOLUME OF BOTTLES MADE OF PLASTIC MATERIAL

- 10 The invention relates to an apparatus for compacting empty plastic bottles, comprising a housing or frame, means for fixing the bottle, means for heating a part of the bottle and a press unit for compacting the softened bottle.

It is known that beverages and other food products are filled more and more often into plastic bottles for sale, and the manufacturers want to produce rather  
15 one-way bottles than repurchasable ones. Thus, these bottles get in large amounts to waste yards or into nature, contaminating thereby the environment or increasing to a great extent the amount of waste.

A further problem is caused by the fact that the material of the plastics do not decompose, thus the damage caused by them is long-lasting.

- 20 In order to eliminate, at least partly, the above problem, a great number of suggestions were made for the domestic annihilation or compacting of such bottles.

The solution is not easy due to the fact that plastic bottles, opposed to metal containers or boxes, regain a significant part of their volume after stopping the  
25 compression. Thus, compacting can only be performed by using compacting and thermal effect simultaneously, wherein the thermal effect does not allow the bottles to increase their volume after ceasing the compression, as a consequence of their elasticity. If, namely, bottles are compressed in their melted state, they do not change their form after cooling down.

- 30 Known bottle compactors generally comprise a housing or frame receiving the bottle, heating means and compressing means.

EP 0707932 discloses a bottle compactor containing a housing chamber designed to receive an empty bottle. The housing is provided with a resistor and

5 a cursor, the end of which is formed like a fork engaging the plastic bottle at its neck part. The cursor with the fork compresses the heated and softened bottle from the upside down. The cursor can be operated manually by means of a lever.

10 FR 2694722 describes a portable device, wherein the power for compacting the bottle arranged in a housing having resistance heating is provided by a spring.

In the bottom of the apparatus described in FR 2668732, there is a separate heating chamber wherein air is heated by resistance heating and the heated air  
15 is pulsed by a fan into a volume containing the plastic bottle, which is compacted by a plate moved by motor driven spindles.

In all the above devices, the bottles are heated from below, and they are usually compressed from above. As a result, the folded plastic layers are irregular and,  
20 in this way, optimal compression can not be achieved.

In other devices, heating is provided along the whole length of the device and/or by means of a patron intruding into the bottle. Such an apparatus is described e.g. in FR 2692190. In this case, the above mentioned disadvantage, namely  
25 the irregular compacting is especially obvious and, in addition, the energy consumption increases significantly as well.

In FR 2712230 the disclosed apparatus has a closed housing with a central heater intruding into the bottle which is compressed both from top to bottom and  
30 from bottom to top. The disadvantage of this is the unnecessarily increased energy requirement of compression and, further on, it is complicated and expensive.

The object of the present invention is to provide a cheap and simple device for  
35 compacting empty plastic bottles to the maximum achievable degree and with a regulated, optimum compression rate.

5 Accordingly, the apparatus according to the invention comprises a housing or frame for receiving the bottle, an element for fixing the bottle, a heating element surrounding part of the bottle and compressing means for compacting the softened bottle, wherein the housing or frame is constructed to receive the bottle with its mouth part upwards, the heating element or the part of the heating  
10 element surrounding the bottle is at most 60 mm high, and is arranged around the neck part of the bottle in its starting position and the fixing element is a sealable plug in the compressing means, to be fitted into the mouth of the bottle and having an air channel, the cross section of which is preferably adjustable, preferably with flow control means. The flow control means may be  
15 a valve.

The compression means and the fixing element for the bottle is a lid or the like moving on vertical guide bars and compressing the bottle towards the base of the housing, by its weight. The lid can also be lifted and lowered by a spindle  
20 driven by an electric motor or by spring means.

Preferably, the diameter of least one section of the plug is adjustable, being an elastic rubber or plastic sleeve and allowing the sealed closing of the mouth of the plastic bottle.  
25

In a preferred embodiment, the height of the heating element does not exceed 60 mm in order to ensure the simultaneous melting only of a relatively thin layer. As a consequence, compacting takes place in regular, narrow bands providing thereby a fully compacted agglomerate.  
30

According to another preferred embodiment, the height of the heating element is larger than 60 mm, but the device can be adjusted so that the bottle intrudes into the heating element only in a section shorter than 60 mm.

35 The apparatus according to the invention allows an efficient, regulated compacting of plastic bottles so that the bellows-like folding occurs on short sections. This can be achieved partly by the small-height heating element,

- 5 partly by controlled compacting. Compacting can be controlled by changing the flow cross section of the airing duct in the plug.

From the viewpoint of controlled and efficient compacting it is also important that melting and pressing takes always place starting from the mouth piece of  
10 the bottle, so that the pieces of smaller diameter can be easily compacted into the following pieces of larger diameter.

In order to obtain maximum compacting, a preferred embodiment is provided with additional, mechanical compacting means.

15

Further details of the invention will be explained by means of embodiments illustrated in the enclosed drawings, wherein

Figure 1 is a section of a preferred embodiment of the invention;

20

Figure 2 is an enlarged section of the plug in the lid of the embodiment shown in Fig.1;

Figure 3 is a partly sectioned view of another embodiment according to the  
25 invention during compacting;

Figure 4 shows part of an embodiment provided with a mechanical after-  
compactor and

30 Figure 5 a photo of a bottle compacted with the apparatus according to the invention compared with a bottle compacted by a traditional method.

The device shown in Figure 1 comprises a base 1, a housing 2, spring means 3 and a bottle holder 4 in housing 2. Bottle holder 4 is kept in upper position by  
35 the spring means 3. At the upper part of housing 2, there are heating element 6 and lid 5.

- 5 In lid 5, there is a plug 7 with an air outlet channel 10 for allowing the air to flow out during pressing.

In use, the bottle 15 to be compacted is placed into the bottle holder 4, and pressed down together with it until impacting on the base 1. With screwing the  
10 lid 5 into the heating element, 6 the bottle is fixed, then the plug 7 is sealed in the mouth-piece of the bottle. After starting the heating, spring means 3 presses the bottle upwards, and as the plastic melts in thin layers, it is compressed continuously to a bellow-like object until the compacting process ends by pressing the neck- and mouth-piece into the middle of the agglomerate.

15

Figure 2 shows the the plug 7 in lid 5. A threaded adjusting sleeve 9 and a ball valve 8 is arranged in the air outlet channel 10 of plug7 for adjusting the free cross section of channel 10. Setting the appropriate spring force in ball valve 8 may be carried out by means of sleeve 9 so that it is drawn upwards or  
20 downwards by a screwdriver thereby controlling the amount and/or flow rate of the air.

Sleeve 9 is screwed into a tube 11 with a threaded section 12 at the upper end. In this way, tube 11 can be raised and lowered by turning the plug 7. When  
25 raised, an elastic sleeve 14 between an outer flange of the tube 11 and a bush 13 is compressed and ,at the same time, its diameter increases. Thus, the mouth piece of the bottle 15 to be compacted is sealed. After this, air can flow out only through the air outlet channel 10, controlled by ball valve 8.

30 Melting of a short section of the bottle 15 is performed by heating element 6 shown in Fig. 3, with reference to another embodiment of the invention. The height of heating element 6 is preferably smaller than 60 mm, in order to keep small the height of the section melted at once, thus making compacting uniform and regular.

35

The height of the heating element 6 can also be larger than 60 mm, in order to ensure an increased heating potential, but than only a section of it ( preferably

5 smaller than 60 mm ) is used for direct melting of the bottle. In this case, bush 13 of the plug 7 seen in Fig. 2 is coupled to the lid 5 by an external thread to enable lowering the bottle 15 with respect to the heating element 6 in the lid 5. In this position, a section of the bottle 15 smaller than 60 mm is heated only.

10 In the embodiment shown in Fig. 3, lid 5 is movable on guide bars 16, and compacting power is gained from the weight of the lid. As a result, the bottle 15 is folded gradually in narrow bands, while air leaves through the air outlet channel 10 of the plug 7 in a controlled manner.

15 Figure 4 shows an embodiment in which the bottle compacted by the weight of the lid (5) can be further compacted by mechanical means. For this additional compacting a gear rim 18 is turned by means of a lever 17 on a gear rack 19 fastened to the lid 5. In this way, the agglomerate of the bottle 15 is further compacted before it cools down. Though the compression in the examples  
20 shown above was provided by the weight of the lid, many other possible embodiments like spindles driven by electric motors can also be used for compacting the bottles.

It is to be noted that the above non limiting examples shown in the disclosure  
25 only illustrate the invention, it is obvious that a skilled person can make other variants without going beyond the scope of the claims enclosed. In these variants compacting can take place by any means of, the apparatus may be closed, or open like the one shown, and the lid may also have many different embodiments.

30

The basic advantage of the device according to the invention is that, to the contrary of most known devices, compacting starts at the neck piece of the bottle, and narrow melted bands are produced during compaction. Moreover, the air flow-out can also be controlled to maintain optimal conditions for  
35 compacting. Due to these factors, the agglomerate has a regular shape and the smallest possible size, since the narrower sections disappear in the bellows-like folded parts. Thereby – as is shown in Fig. 5 – the volume of the waste is



- 5 significantly reduced as compared to the state of art. Furthermore, as it provides a simple and inexpensive way for compacting the bottles, the number of thrown away bottles loading the environment will also probably be reduced.

5

## C L A I M S

10

1. Apparatus for compacting empty plastic bottles, comprising a housing or frame for receiving the bottle, an element for fixing the bottle, a heating element surrounding part of the bottle and compressing means for compacting the softened bottle, characterized in that

15

20

- the housing or frame is constructed to receive the bottle (15) with its mouth part upwards;
- the heating element (6) or the part of the heating element (6) surrounding the bottle (15) is at most 60 mm high, and is arranged around the neck part of the bottle (15) in its starting position and
- the fixing element is a sealable plug (7) in the compressing means, to be fitted into the mouth of the bottle (15) and having an air channel (10).

2. Apparatus according to claim 1 characterized in that the cross section of the air channel (10) is adjustable.

25

3. Apparatus according to claim 1 characterized in that the compression means and the fixing element for the bottle (15) is a lid (5) moving on vertical guide bars (16).

30

4. Apparatus according to claim 3 characterized in that the lid (5) is compressing the bottle (15) towards the base of the housing, by its weight.

5. Apparatus according to claim 4 characterized in that the lid (5) is lifted and lowered by a spindle driven by an electric motor.

35

6. Apparatus according to claim 4 characterized in that the lid (5) is lifted by spring means (3).

5

7. Apparatus according to any of claims 1-6 characterized in that in the air channel (10) of the plug (7) is provided with flow control means.

10

8. Apparatus according to claim 7 characterized in that the flow control means is a valve.

9. Apparatus according to any of claims 1-8 characterized in that the diameter of least one section of the plug (7) is adjustable.

15

10. Apparatus according to claim 9 characterized in that the section of adjustable diameter is an elastic rubber or plastic sleeve (9).

20

11. Apparatus according to any of claims 1-10 characterized in that the height of the heating element (6) is at most 60 mm.

12. Apparatus according to any of claims 1-10 characterized in that the heating element (6) is arranged in a position to surround the bottle (15) in a height of at most 60 mm.

25

13. Apparatus according to any of claims 1-12 characterized in that mechanical means for additional compacting are provided.

30

14. Apparatus according to claim 13 characterized in that the additional mechanical compacting means is a gear rim (18) gearing in a gear rack (19) on the back side of the lid (5), wherein the gear rim (18) is provided with a manually operated lever.

1/5

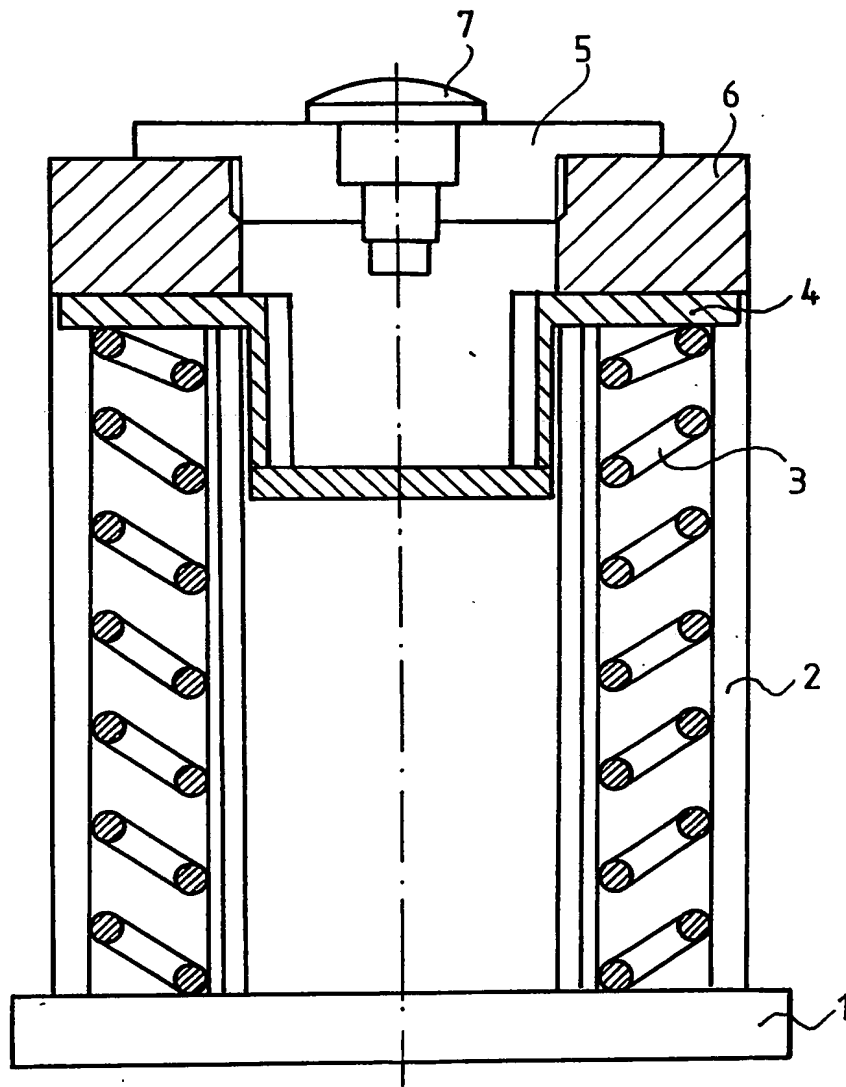


Fig. 1

2/5

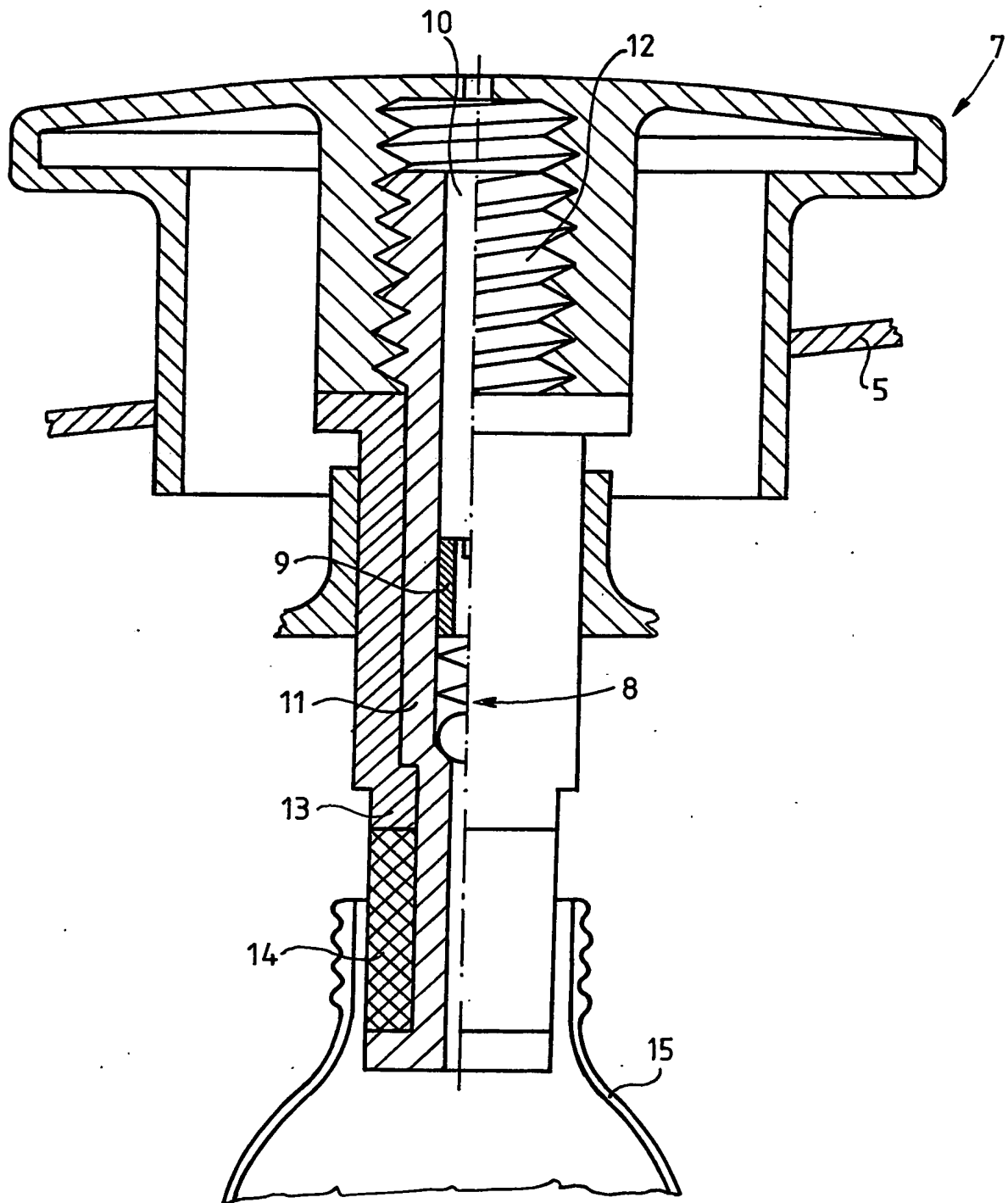


Fig. 2

3/5

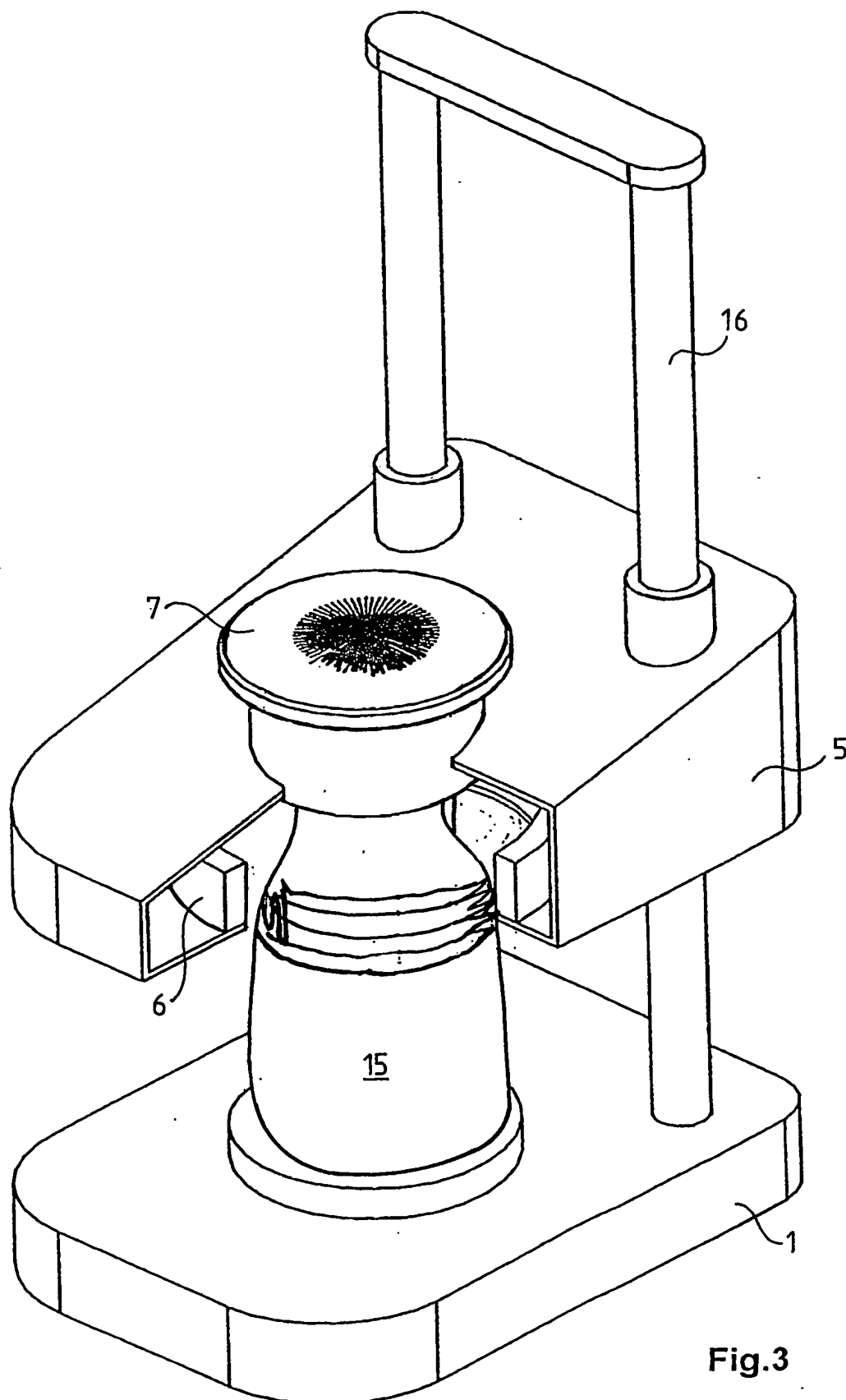


Fig.3

4/5

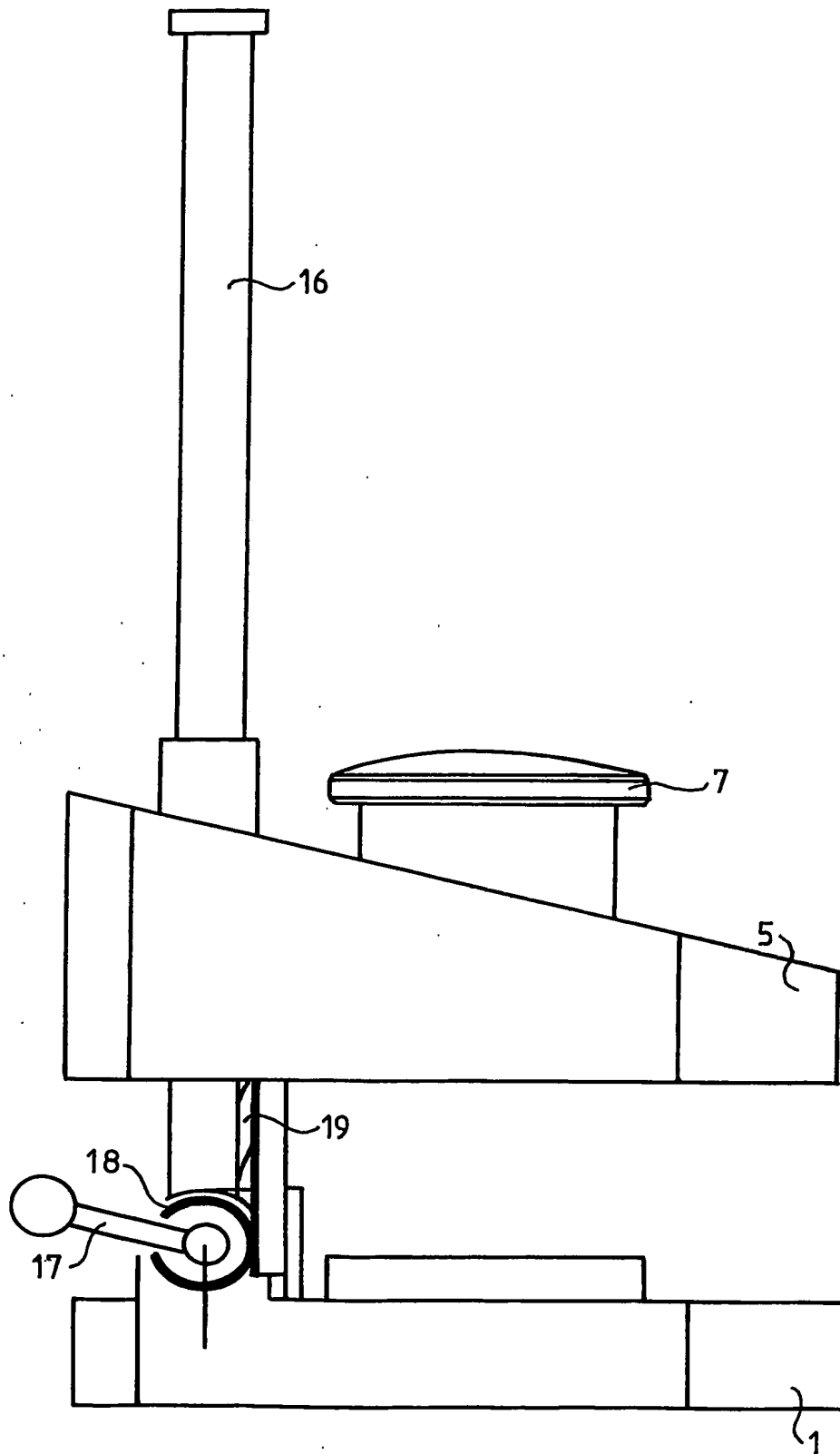


Fig. 4

5/5

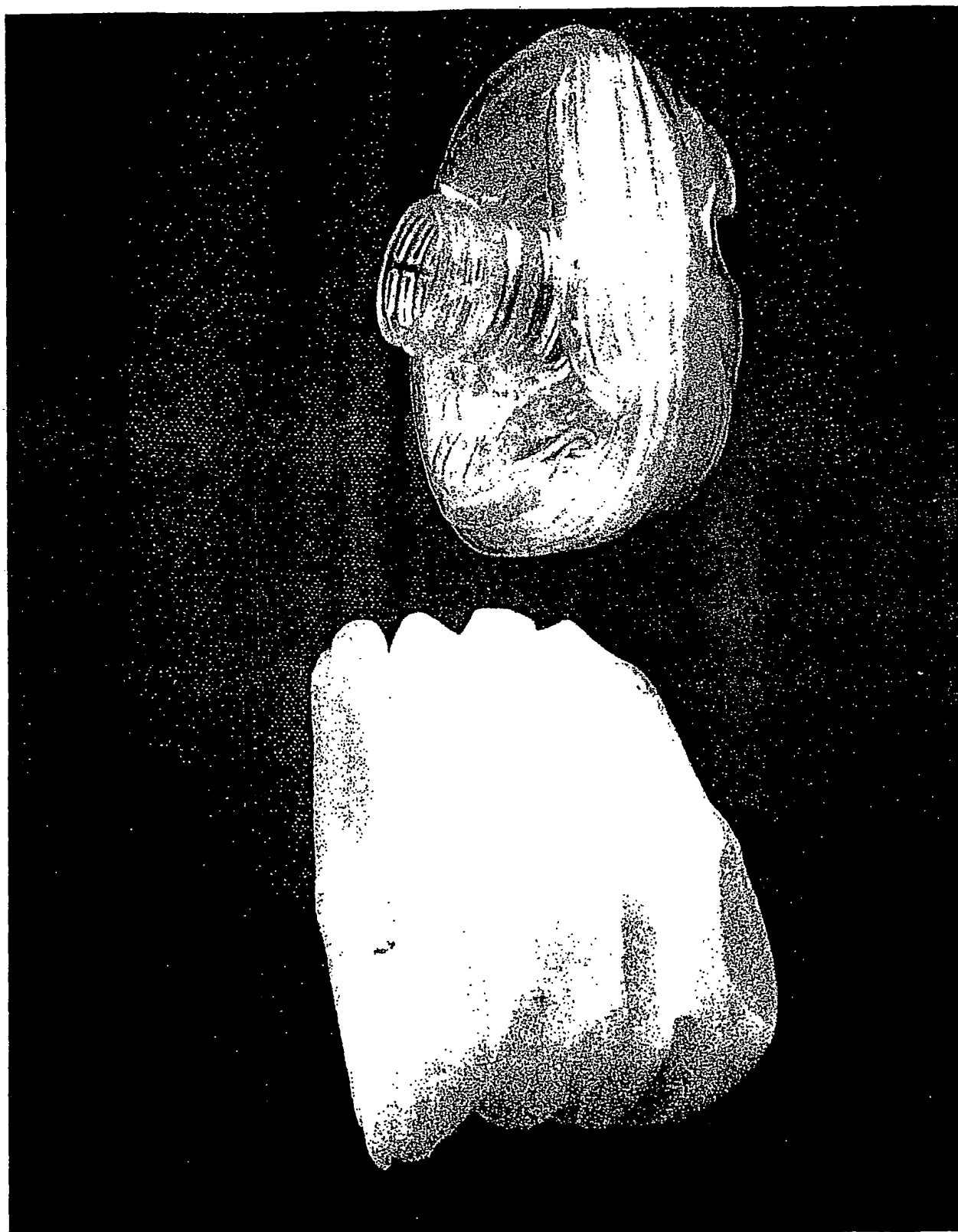


Fig. 5

BEST AVAILABLE COPY



## INTERNATIONAL SEARCH REPORT

Application No  
PCT/JP 02/00159A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B30B9/32 B29B17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B30B B29B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 07, 31 July 1997 (1997-07-31) & JP 09 066526 A (SHIMADZU CORP), 11 March 1997 (1997-03-11) abstract; figures ---	1
Y	FR 2 709 699 A (AKKOUCHI JACQUES) 17 March 1995 (1995-03-17) page 4, line 8 - line 18; figure ---	1
A	FR 2 712 230 A (VALLEE FABIENNE) 19 May 1995 (1995-05-19) cited in the application abstract; figures ---	1, 3, 4, 11-13
	--- -/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

23 April 2003

Date of mailing of the international search report

06/05/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Belibel, C

## INTERNATIONAL SEARCH REPORT

tional Application No  
PCT/JP 02/00159

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 707 932 A (CUTOLO GIANFRANCO ;VERDIRAME CARMELO (IT); AITA & ASSOCIATED INSPE) 24 April 1996 (1996-04-24) cited in the application abstract; figures ----	1,3, 11-14
A	FR 2 668 732 A (DUCRUEZ RAYMOND) 7 May 1992 (1992-05-07) cited in the application abstract; figures ----	1,3,5
A	FR 2 692 190 A (METAYER RAYMOND) 17 December 1993 (1993-12-17) cited in the application abstract; figures -----	1,3,6

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/CHU 02/00159

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
JP 09066526	A	11-03-1997	NONE		
FR 2709699	A	17-03-1995	FR	2709699 A1	17-03-1995
FR 2712230	A	19-05-1995	FR	2712230 A1	19-05-1995
EP 0707932	A	24-04-1996	IT EP	1270674 B 0707932 A2	07-05-1997 24-04-1996
FR 2668732	A	07-05-1992	FR	2668732 A1	07-05-1992
FR 2692190	A	17-12-1993	FR	2692190 A1	17-12-1993